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and Cattle Production on
Ponderosa Pine Range

THE
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U.S. Rocky Mountain Forest and Range Experiment Station,
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RELATIONSHIP BETWEEN TIMBER AND CATTLE PRODUCTION
ON PONDEROSA PINE RANGE:

THE WILD BILL RANGE¹

by

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and

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¹ The Wild Bill Range is part of a cattle grazing allotment on the Coconino National Forest used as a pilot test to obtain direction and guides for management. As such, it offers an area and opportunity for timber, forage, and grazing evaluations.

² Central headquarters maintained in cooperation with Colorado State University at Fort Collins; authors are located at Flagstaff in cooperation with Northern Arizona University.

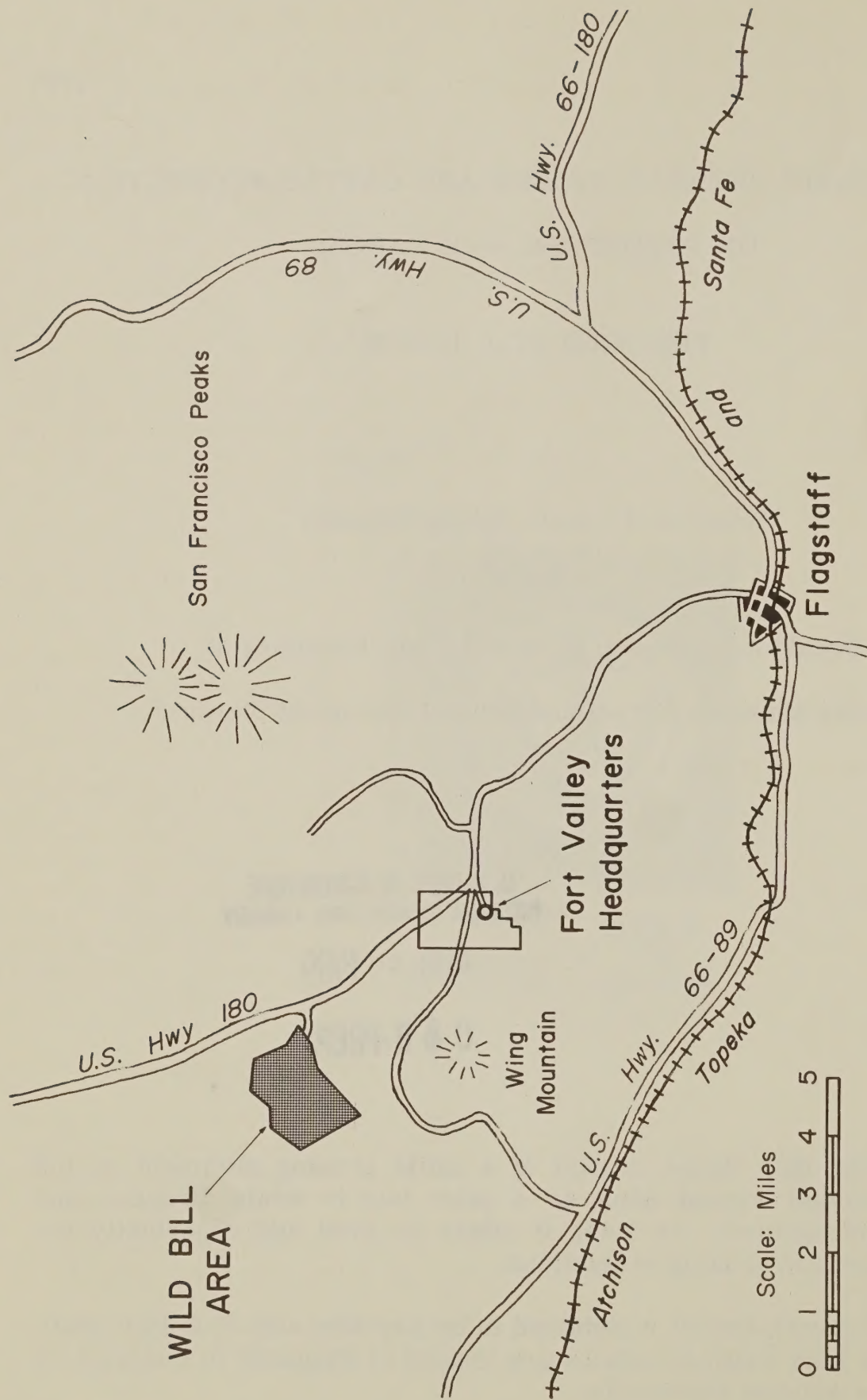


Figure 1.--Location of the Wild Bill study area.

Relationship Between Timber And Cattle Production

On Ponderosa Pine Range: The Wild Bill Range

by

Henry A. Pearson and Donald A. Jameson

Good multiple use planning requires that the relationships between production of various land products be understood. A question that often needs to be answered is: If we modify an area in favor of one product, what will be the effect on other products? An area of approximately 1,300 acres of ponderosa pine-bunchgrass range on the Wild Bill Cattle Allotment of the Coconino National Forest is being used for such an evaluation (fig. 1). The area (hereafter called the Wild Bill Range) is located 13 miles northwest of Flagstaff, Arizona, and is accessible by forest roads which originate on U. S. Highway 180.

The specific objectives of this evaluation are to determine:

1. The effect of various tree overstories on quantity, quality, and composition of forage.
2. The relationship between beef and timber production at various tree overstories.

This information will provide a basis for estimating changes in beef production following various land treatments applied to the Beaver Creek Pilot Watershed.³ It will also aid in developing management practices for other timbered ranges.

Climatic and Physical Conditions

The annual mean temperature is 43° F. The mean monthly temperature for January is

³ Worley, David P. *The Beaver Creek pilot watershed for evaluating multiple-use effects of watershed treatments*. U.S. Forest Serv. Res. Pap. RM-13, 12 pp., illus. 1965. Rocky Mountain Forest and Range Exp. Sta., Fort Collins, Colo.

25° F.; for July, 63° F. Freezing temperatures have been recorded in midsummer. The average length of the growing season is 94 days; the average frost-free period extends from July 17 to September 19.

Average annual precipitation approximates 23 inches. About half falls in the form of snow during the winter; the remainder falls as rain during the summer and fall.

The land is generally level to moderately sloping toward the southwest. Elevation varies from approximately 7,400 feet to over 7,800 feet. There is no major drainage in the area.

Two soil series have been described on the area. Both are derived from basalt parent material, and differ only in their degree of soil development. The soil texture of both series is gravelly silt loam, which varies in depth from shallow rocky soil to over 5 feet. In contrast to agricultural soils, the general fertility is considered low, but high yields of either timber or herbs are possible.

Overstory Vegetation

The overstory vegetation is ponderosa pine.⁴ The Wild Bill Range had not been logged or thinned for many years prior to the present treatments. The uneven-aged stand includes high numbers of young trees established in 1919 through natural regeneration, and some older trees dating back to the 1800's (fig. 2).

⁴ Common and botanical names of plants, in the order they are mentioned in the text, appear on p. 10.



Figure 2.--Aerial view of the ponderosa pine stand prior to treatments.

Understory Vegetation

Arizona fescue and mountain muhly make up the major portion of the understory (fig. 3). Other grasses and grasslike plants include sedges, mutton bluegrass, bottlebrush squirreltail, pine dropseed, and Junegrass. A variety of forbs include lupine, senecio, thistle, and many others. The only observed browse species in the area is Fendler ceanothus.

Measurements of trees and understory vegetation on the area prior to treatment showed the relationship between herbage production and tree overstory (fig. 4). Most of

the differences were in the two major forage species, Arizona fescue and mountain muhly.

The understory herbage has two principal growing seasons--one in the spring characterized by cool-season grasses, and the other following the summer rains characterized by warm-season grasses (fig. 5).

Land Treatments

The Wild Bill Range includes seven units fenced separately (fig. 6). Two of the units were cleared, four units were thinned to different tree densities, and one unit was left

Figure 3.--The understory herbage is primarily Arizona fescue and mountain muhly.



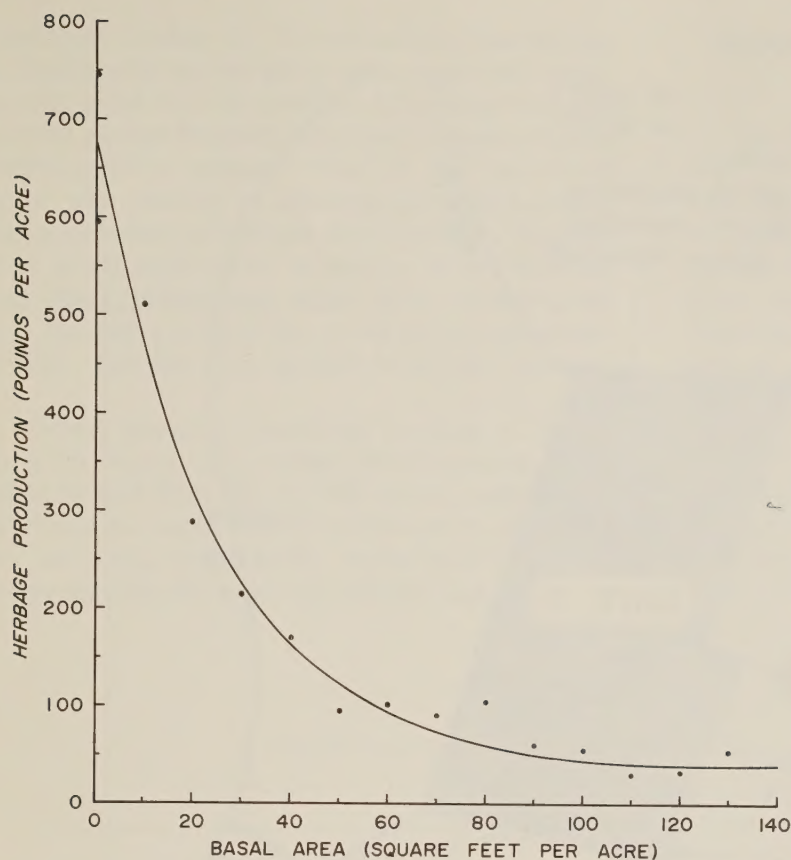


Figure 4.--Herbage production as related to the basal area of ponderosa pine stand in 1962 prior to treatment.

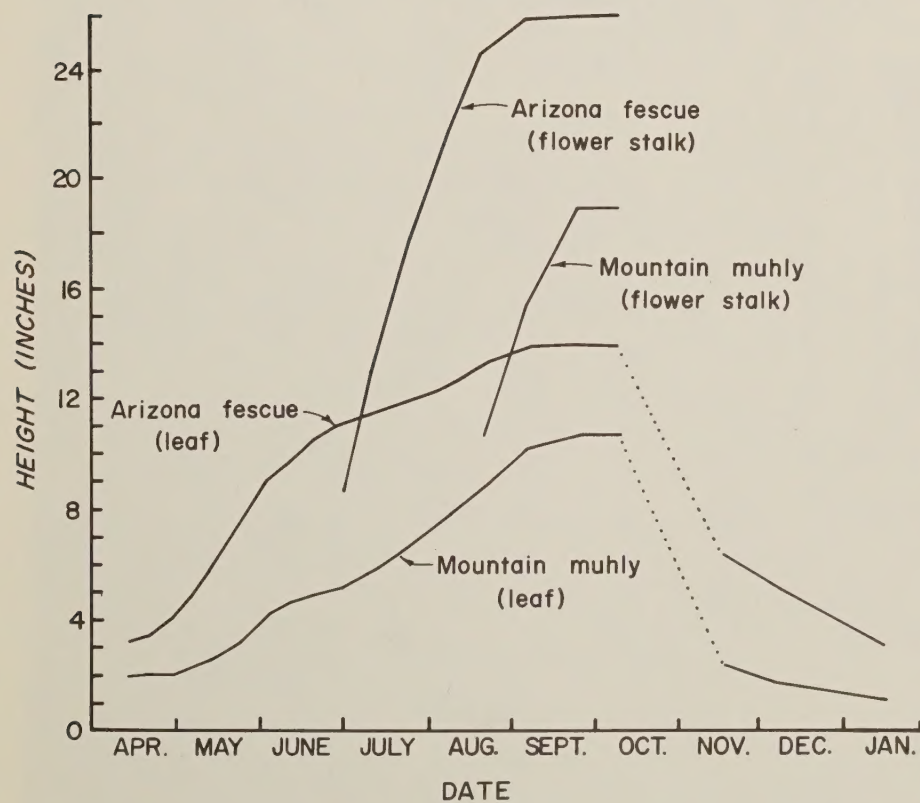


Figure 5.--
Maximum height of leaves and flower stalks of main forage-producing species.

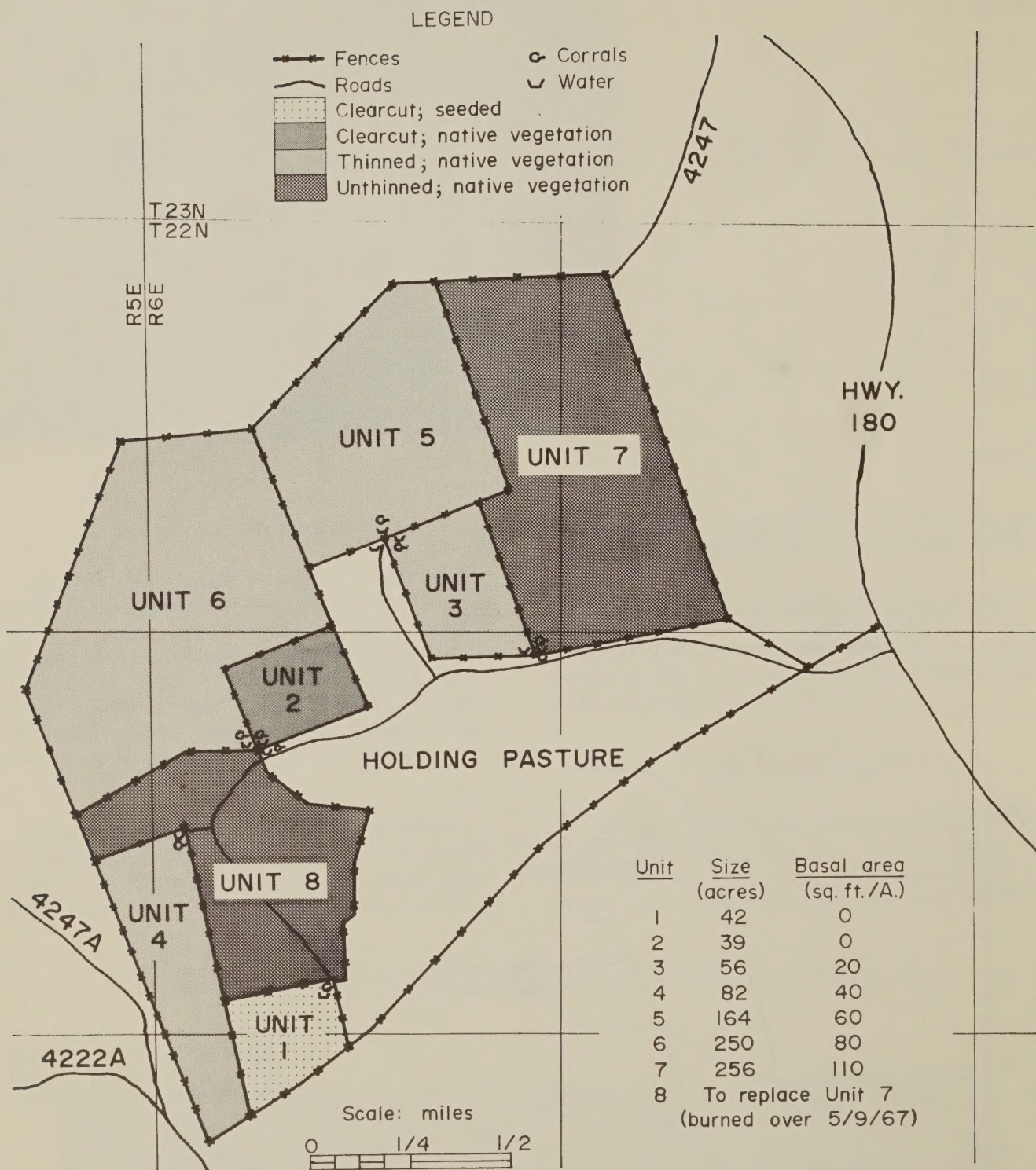


Figure 6.--Layout of the units on the Wild Bill Range.

unthinned (table 1). Merchantable sawtimber and pulpwood on the area were removed under commercial sale procedure. Coconino National Forest crews thinned additional required non-merchantable stems. One of the clear-cut units was seeded to crested and intermediate wheatgrasses and yellow sweetclover. Vegetation in all other units is native. After thinning and clearcutting, the slash (fig. 7) was piled and burned so animals could graze the areas freely, and the fire hazard would be reduced.

Other physical facilities include a corral in each range unit, water developments, portable scales (fig. 8), access roads, and fences. Because no water developments were available on the area, trick tanks were built to supply water during the grazing season (fig. 9).

Range Management

Yearling Hereford heifers graze each unit for a 4-month season, June through September. The rate of stocking is determined by the utilization of Arizona fescue and mountain muhly. Forty percent use has been set as the goal for proper management of these two species. Five yearlings graze each unit the entire grazing season, and additional animals are available to obtain the desired utilization.

Water and salt are manipulated to provide uniform grazing in each unit. Trap gates at the water facilities are used to catch animals for weighing and other observations (fig. 10).

Figure 7.--Pine forest thinned to 40 square feet basal area per acre.



Table 1. --The overstory treatments applied to the range units

Range units ¹	Ponderosa pine--		Treatment completed ³
	Basal area thinning level ²	Canopy cover	
	Sq. ft. /acre	Percent	
1	0	0	1962
2	0	0	1962
3	20	12	1965
4	40	19	1963
5	60	29	1964
6	80	30	1964
7	⁴ 110	60	

¹ Unit 1 was seeded to crested and intermediate wheatgrasses and yellow sweetclover; all other units are native vegetation.

² Basal area thinning level denotes actual basal area in stands with tree diameters of 10 inches and larger. Stands with an average diameter of less than 10 inches contain less basal area than designated, but will attain that basal area when their average diameter has increased to 10 inches.

³ Includes thinning and slash disposal. Pulpwood was removed from all units in the spring of 1963; sawtimber was removed in the fall of 1963.

⁴ Value represents actual basal area instead of thinning level, since unit is untreated. Part of pasture 7 was burned over by a crown fire on May 9, 1967, and is being replaced with pasture 8.

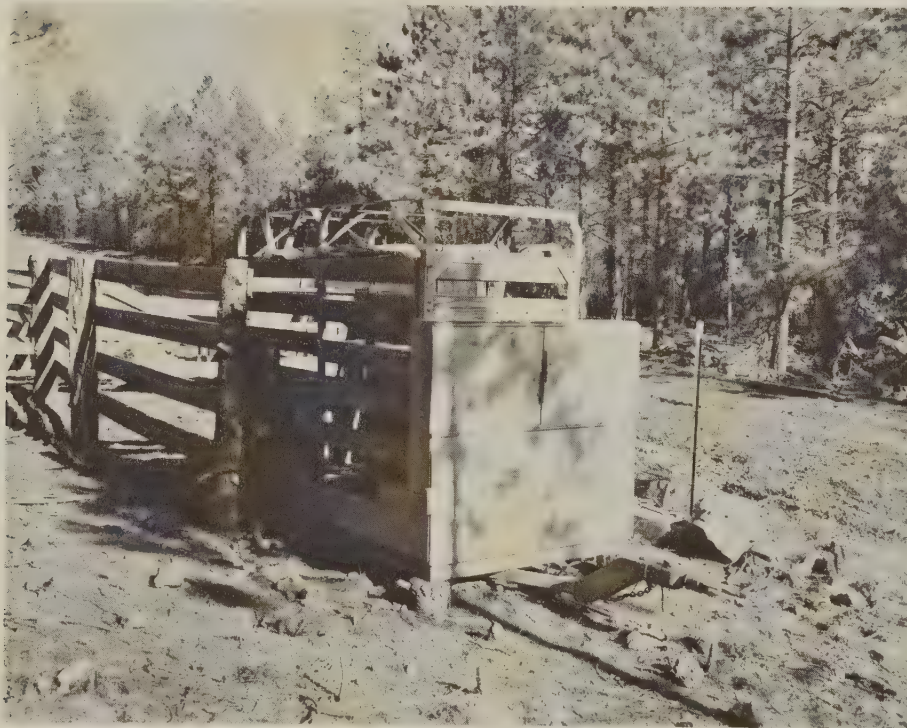


Figure 8.--
Cattle are weighed at
6-week intervals on
this portable scale.



Figure 9.--Trick tank for storing livestock drinking water.

Figure 10.--Trap gate at the water facilities to catch animals.





Figure 11.--Collecting vegetation for production determinations.

Measurements

Forty-five permanent sampling points are established in each unit. Utilization, production, and forage digestibility are determined by the paired-plot method on temporary plots near the sampling points at 6-week intervals during each grazing season (fig. 11).

Forage digestibility is determined by the artificial rumen (*in vitro*) technique. In this technique, which simulates natural digestion under laboratory conditions, small amounts of forage are fermented with rumen microorganisms in a buffered nutrient medium

under controlled conditions of anaerobiosis, temperature, and pH. Rumen fistulated cattle supply the rumen microorganisms (fig. 12).

Tree basal area is measured by the Bitterlich plotless method with a 10-factor prism. Diameters of the counted trees are measured (fig. 13). Tree crown cover is determined by use of a spherical densiometer (fig. 14). This instrument measures the percent crown in a 90° cone above the sampling point.

Cattle are weighed at 6-week intervals. Wildlife presence on the area is estimated from pellet group counts.



*Figure 12.--
Rumen fluid for artificial rumen digestion trials is obtained from fistulated cattle.*



Figure 13.--Measuring diameter of the ponderosa pine to determine tree growth.

Figure 14.--Spherical densiometer used to determine ponderosa pine crown cover.



Other Uses

Hunting in the area is expected to increase, due to newly constructed access roads. All cattle are removed and gates are opened before hunting seasons begin so that hunters have complete use of the area. Recreation use is presently light, but sightseeing and other informal use can also be expected to increase with improved access.

Administration

The area is under the administration of the Coconino National Forest. The Forest administers the grazing permit and other uses of the area, furnishes protection from fire and trespass, and constructs and maintains roads and other physical facilities. The Rocky Mountain Forest and Range Experiment Station takes all measurements and makes the evaluations. The CO Bar Cattle Company cooperates by supplying the grazing livestock.

COMMON AND BOTANICAL NAMES OF PLANTS MENTIONED

Ponderosa pine	<i>Pinus ponderosa</i> Laws.
Arizona fescue	<i>Festuca arizonica</i> Vasey
Mountain muhly	<i>Muhlenbergia montana</i> (Nutt.) Hitchc.
Sedges	<i>Carex</i> spp.
Mutton bluegrass	<i>Poa fendleriana</i> (Steud.) Vasey
Bottlebrush squirreltail	<i>Sitanion hystrix</i> (Nutt.) J. G. Smith
Pine dropseed	<i>Blepharoneuron tricholepis</i> (Torr.) Nash
Junegrass	<i>Koeleria cristata</i> (L.) Pers.
Lupine	<i>Lupinus</i> spp.
Senecio	<i>Senecio</i> spp.
Thistle	<i>Cirsium</i> spp.
Fendler ceanothus	<i>Ceanothus fendleri</i> A. Gray
Crested wheatgrass	<i>Agropyron cristatum</i> (L.) Gaertn.
Intermediate wheatgrass	<i>Agropyron intermedium</i> (Host) Beauv.
Yellow sweetclover	<i>Melilotus officinalis</i> (L.) Lam.

